

REMARKS

Pending in the application are claims 1-21, of which claims 1, 20 and 21 are independent. The following comments address all stated grounds for rejection and place the presently pending claims, as identified above, in condition for allowance

Rejections Pursuant to 35 U.S.C. §112

The Examiner has rejected claims 1-21 as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. Applicants submit amended claims 1, 20 and 21 to address this rejection, wherein the term "single data point" has been amended to more accurately recite the language of the specification. These currently amended claims now recite a "single extrema data point". Applicants submit that this amendment to the claims introduces no new matter and is fully supported by the specification as filed. Applicants therefore request that the Examiner withdraw the rejection under 35 U.S.C. §112 and pass claims 1-21 to allowance.

Rejections Pursuant to 35 U.S.C. §102(b)

The Examiner has rejected claims 1-6, 13-15 and 18-21 pursuant to 35 U.S.C. §102, as being unpatentable over U.S. Patent No. 6,240,370 to Sonneland. Applicants respectfully traverse this rejection in view of currently amended independent claims 1, 20 and 21. Applicants further submit that said claim amendments are fully supported by the originally filed specification and introduce no new matter.

The present invention, as disclosed in currently amended independent claim 1, recites the identification of a plurality of extrema positions associated with seismic data, followed by the derivation of coefficients that characterize the seismic data waveform in the vicinity of the extrema positions from a single *extrema* data point. Groups of extrema positions are then formed *using a Gaussian statistical model*, wherein the derived coefficients are similar. Independent claims 20 and 21 further recite a computer system and computer program in keeping with the means recited in presently amended claim 1.

As submitted previously, Applicants submit that the cited Sonneland reference solely recites the processing of seismic signals which are reflected by a particular subsurface feature by decomposing the reflected signals with respect to a series of polynomial coefficients which characterize the reflectivity of the subsurface feature. As set forth in the present invention, this is one suitable means for the derivation of extrema positions.

Applicants further submit that the cited art to Sonneland fails to recite or disclose each element of the presently amended claims. In particular, as recited in claim 1, the derivation of coefficients that characterize the seismic data waveform from a single *extrema* data point, in the vicinity of the extrema positions, is neither recited nor disclosed by the Sonneland art. In direct contrast, Sonneland recites the observation of *polynomial coefficients* for use in detection of subsurface geological conditions. Applicants further submit that the forming of groups of these extrema positions *using a Gaussian statistical model*, as recited in presently amended claims 1, 20 and 21, is neither recited nor disclosed by the cited art.

Applicants further submit that dependent claims 2-6, 13-15 and 18-19, which depend on claim 1 for support, are in condition for allowance by their very nature as dependent claims which further limit independent claim 1. Applicants additionally submit that the elements recited in these independent claims are neither recited nor disclosed by the Sonneland reference. For example, Applicants note that claim 18 recites the use of groups of extrema positions in the creation of a horizontal interpretation. Furthermore, claim 19 recites the use of the aforementioned groups of extrema positions in extracting a seismic volume containing multiple reflectors having similar seismic response. Applicants submit that these groups of extrema positions are formed using the Gaussian statistical model recited in pending independent claim 1. Applicants therefore submit that the use of groups of extrema position such as these are neither recited nor disclosed in the cited art.

In view of the above, Applicants respectfully submit that the Sonneland reference fails to anticipate claims 1-6, 13-15 and 18-21 of the present invention, of which claims 1, 20 and 21 are independent. Applicants therefore request that the Examiner withdraw the aforementioned rejection and pass claims 1-6, 13-15 and 18-21, as presently presented, to allowance.

Rejections Pursuant to 35 U.S.C. §103(a)

The Examiner rejected claims 8-12 pursuant to 35 U.S.C. §103 as being unpatentable over Sonneland in view of U.S. Patent No. 5,615,171 (hereinafter "Hildenbrand"). The Examiner has further rejected claims 16-17 under 35 U.S.C. §103 in view of Sonneland and further in view of U.S. Patent Application No. US2003/0023383 A1 (hereinafter "Stark"). For the reasons set forth below, Applicants respectfully traverse these rejections.

As set forth in Applicants earlier responses, Hildebrand recites a method for seismic data interpretation by selection of 3 dimensional seismic data for use in subsurface geology and geometry analysis. Individual seismic events or horizons are tracked or picked through 3-dimensional volumes of data in accordance with the Hildebrand reference. Additionally, the cited reference to Stark recites a system for analyzing seismic data which includes the generation of a derived data volume based on a selected geologic time volume of a subsurface region of interest. In accordance with the Stark reference, the derived data volume may include various volumes such as discontinuity volumes or fault volumes.

Applicants respectfully submit that dependent claims 8-12 and 16-17, which rely of currently amended claim 1 for support, are not rendered obvious by Hildebrand and Stark and are further in condition for allowance as drafted.

As currently amended, claim 1 of the current application recites the identification of a plurality of extrema positions associated with seismic data, the derivation of coefficients that characterize the seismic data from a single *extrema* data point in the vicinity of the extrema positions and the forming of groups of extrema positions *using a Gaussian statistical model*, where the coefficients that characterize the seismic data waveforms are similar. Dependent claims 8-12 and 16-17 serve to further narrow this dependent claim by introducing additional elements.

In reference to the rejection of claims 8-12, Applicants submit that Hildebrand fails to teach or suggest the formation of groups of extrema positions using a Gaussian statistical model, wherein the use of supervised or unsupervised classification methods are further used in the formation of groups of extrema positions. Applicants submit that the formation of groups of extrema positions based upon derived coefficients from a single extrema data point, using the various classification techniques recited herein, is neither taught nor suggested by Hildebrand. As submitted previously, Hildebrand solely recites iterative picking of a "seed point" by a user based on information such as maximum or minimum amplitude and clearly fails to teach or suggest the formation of groups of extrema positions using a Gaussian statistical model, where the derived coefficients that characterize the seismic data waveform are derived from a single extrema data point. In view of this, Applicants respectfully submit that presently pending claims 8-12 are not rendered obvious in view of the Sonneland and Hildebrand references. Applicants therefore respectfully request that the Examiner pass claims 8-12 to allowance as drafted.

Addressing claims 16 and 17, Applicants again submit that claims 16 and 17 are not rendered obvious by the cited references as the cited references fail to teach or suggest each element of the presently pending claims. Pending dependent claim 16, which relies on claim 15 for support, recites the determination of fault displacement estimates using extracted horizon estimates wherein these horizon segments are extracted on opposite side of input fault surfaces. Claim 17 of the presently pending application, which relies on claim 16 for support, further recites that fault displacement estimates are decomposed into vertical throw and horizontal heave components. Applicants submit that each of these elements is neither taught nor suggested by the cited references. As set forth prior, Applicants submit that the cited reference Sonneland reference fails to teach or suggest each element of currently amended claim 1, on which dependent claims 16 and 17 rely indirectly. For example, the derivation of coefficients that characterize the seismic data *from a single extrema data point* in the vicinity of the extrema positions and the *grouping of extrema positions using a Gaussian statistical model* is neither taught nor suggested by Sonneland. Applicants further submit that the Stark reference additionally fails to teach or suggest such elements. In view of this, Applicants submit that the underlying dependent claim, on which claims 16 and 17 rely, is in condition for allowance in view of the cited art. In view of this, Applicants believe that claims 16 and 17 are not rendered obvious and are in condition for allowance.

Application No.: 10/820,302

Docket No.: 60.1531

Conclusion

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account N°. 19-0615, under Order No. 60.1531 from which the undersigned is authorized to draw.

Dated: June 8, 2006

Respectfully submitted,

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